



*Irvine Ranch Water District*  
*San Diego Creek Natural Treatment System*

# Irvine Ranch Water District At A Glance

- California Water District
- 20% of Orange County; population 266,000
- Publicly-Elected Board
  - 5 members at large
- Multiple Services:
  - Potable Water
  - Irrigation/Recycled Water
  - Sewage Collection and Treatment
  - Urban Runoff Treatment
- Environmental Stewardship



# Orange County



**Location Within**  
**Orange County**

**Irvine Ranch**  
**Water District**

# San Diego Creek Watershed At A Glance

- **Primary freshwater source for Newport Bay**
- **118 square miles**
- **City of Irvine and portions of:**
  - City of Lake Forest
  - City of Newport Beach
  - City of Orange
  - City of Tustin
  - Unincorporated County
- **4 types of pollutants**
  - Nutrients
  - Sediment
  - Pathogens
  - Toxics



# *Newport Harbor*

Pacific Ocean

UC Irvine

## *Upper Newport Bay*

UC Natural Reserve

San Diego Creek

Natural Treatment System  
Ponds

The Duck  
Club

Carlson  
Marsh

IRWD Plant  
(MWRP)

Restored wetlands/  
uplands

San Joaquin Marsh



# Initial “Natural Treatment Site” San Joaquin Marsh

- 320 acres owned and operated by IRWD
- Restoration/enhancement initiated in 1995
- 68 acres of Natural Treatment System Ponds
- Removes about 70% of nitrogen in water pumped from San Diego Creek (75,000 pounds removed last year)
- Removal of 50,000 tons of sediment and 10,000 pounds of phosphorus each year from San Diego Creek desilting basins

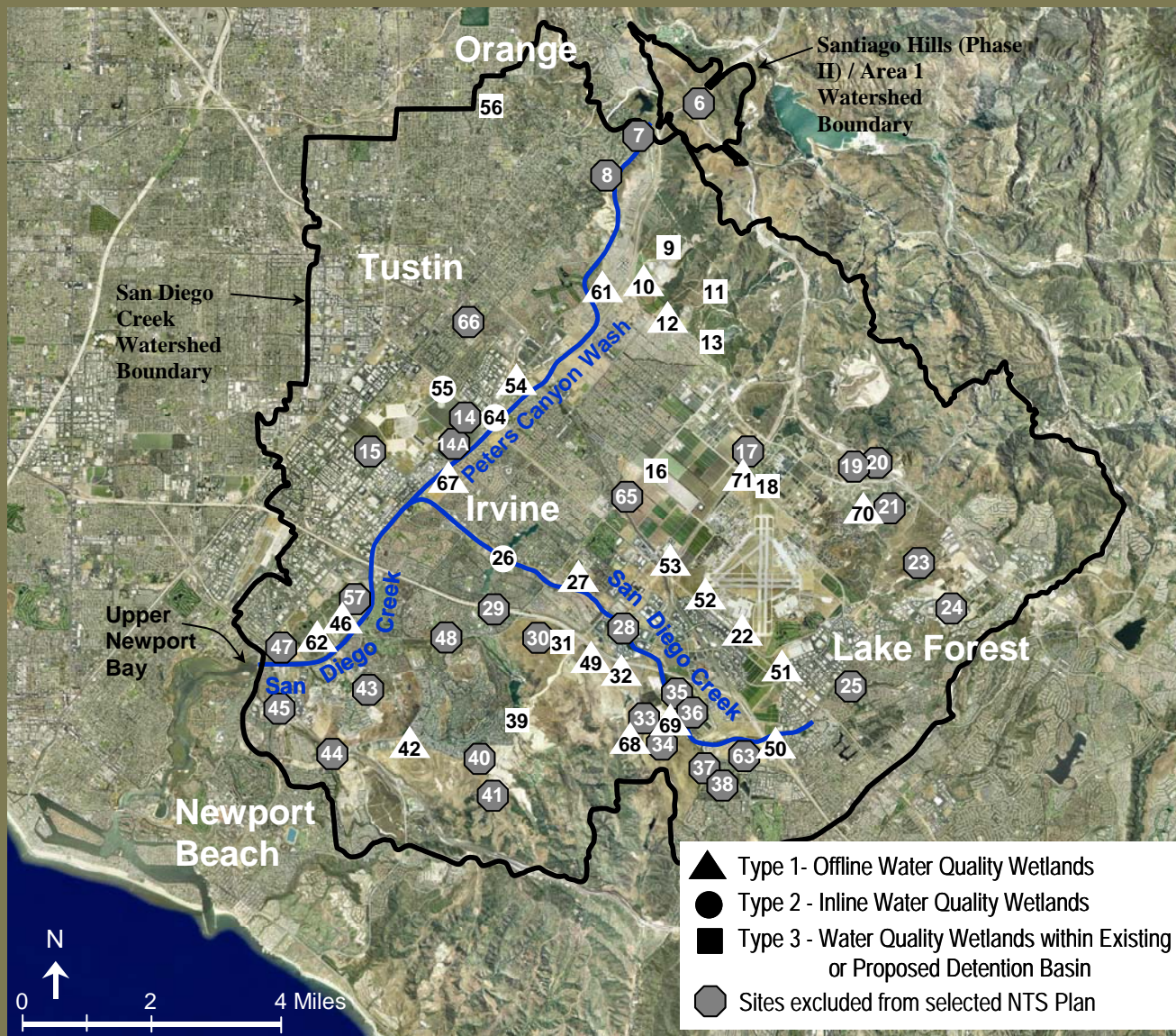


# Expanding SJM Success to “System” Approach -- Objectives of NTS

- Regional solution to urban runoff
- Treat pollutants from existing urban and natural sources - and new development
- Dry weather (349 days) and “first flush” treatment
- Strategically locate facilities to optimize pollutant removal
- Efficient joint use of public facilities (flood control channels and basins)
- Incremental habitat and open space benefits for NCCP and the watershed



# San Diego Creek Watershed Site Map



- 71 Opportunity Sites Evaluated

- Serving New and Existing Communities

- Prioritized by:

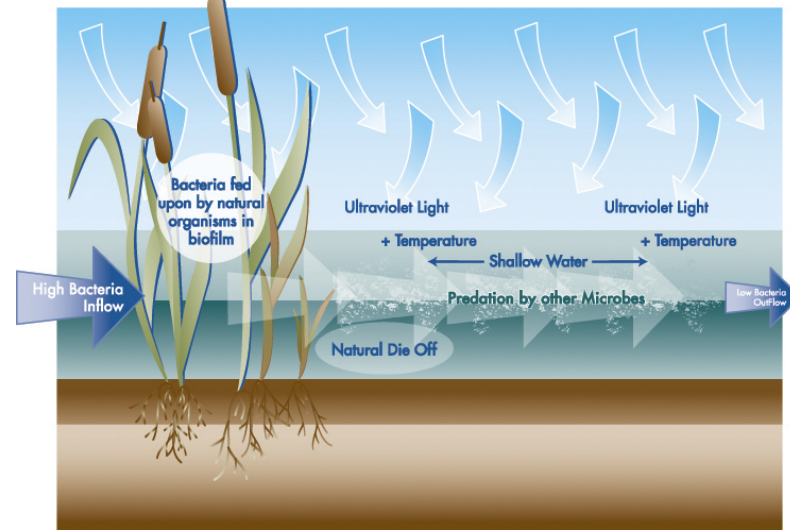
- Effectiveness
- Availability
- Cost
- Constructability

- 31 Sites Proposed for Construction

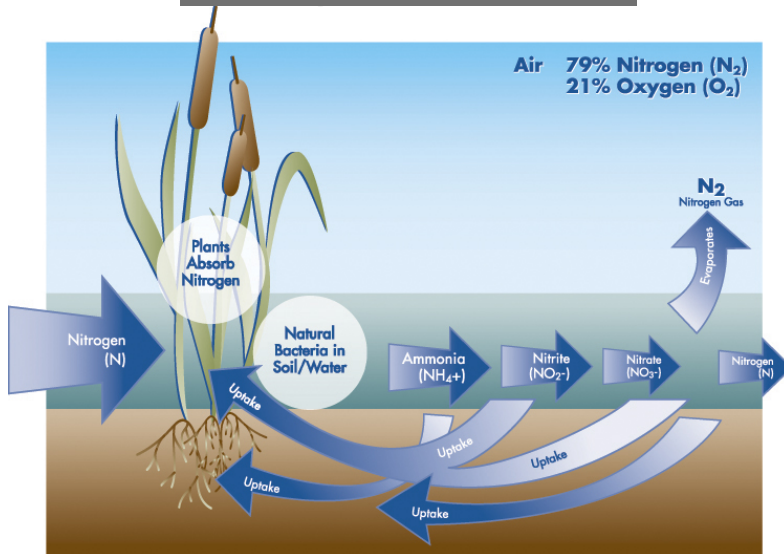
# Pollutant Removal

- Pathogens
- Nitrogen
- Phosphorus

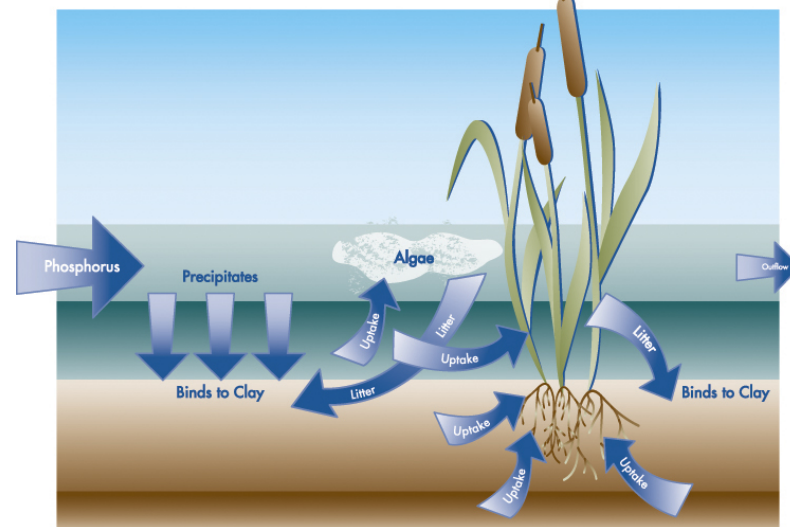
## Pathogen Removal



## Nitrogen Removal



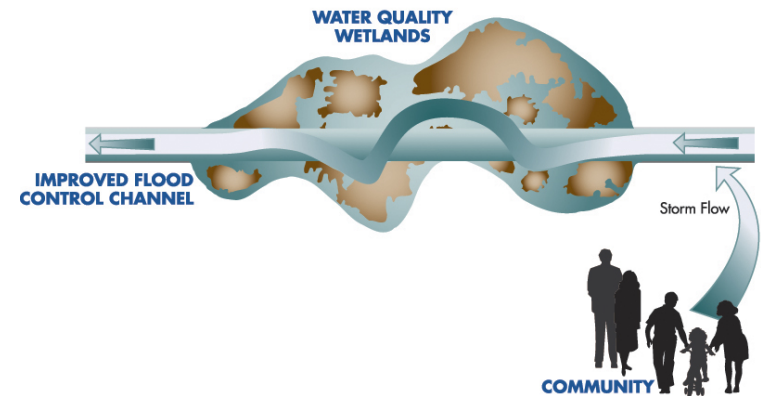
## Phosphorus Removal



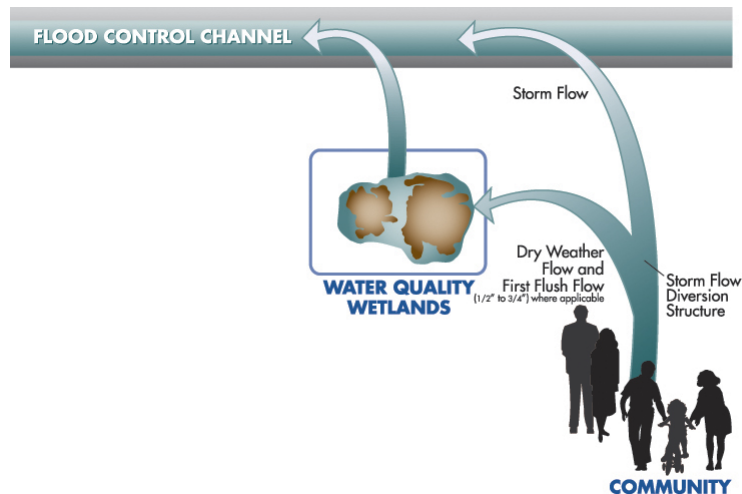
# Types of Wetlands

- Type I -- Offline
- Type II -- Inline
- Type III -- Colocated Within Detention Basins

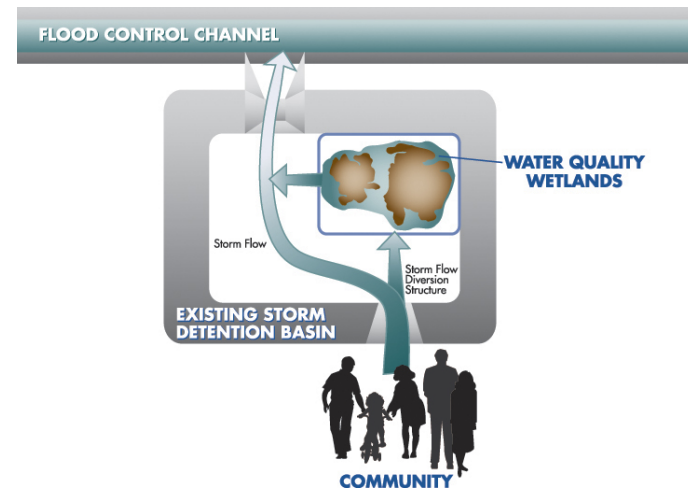
## Type II -- Inline



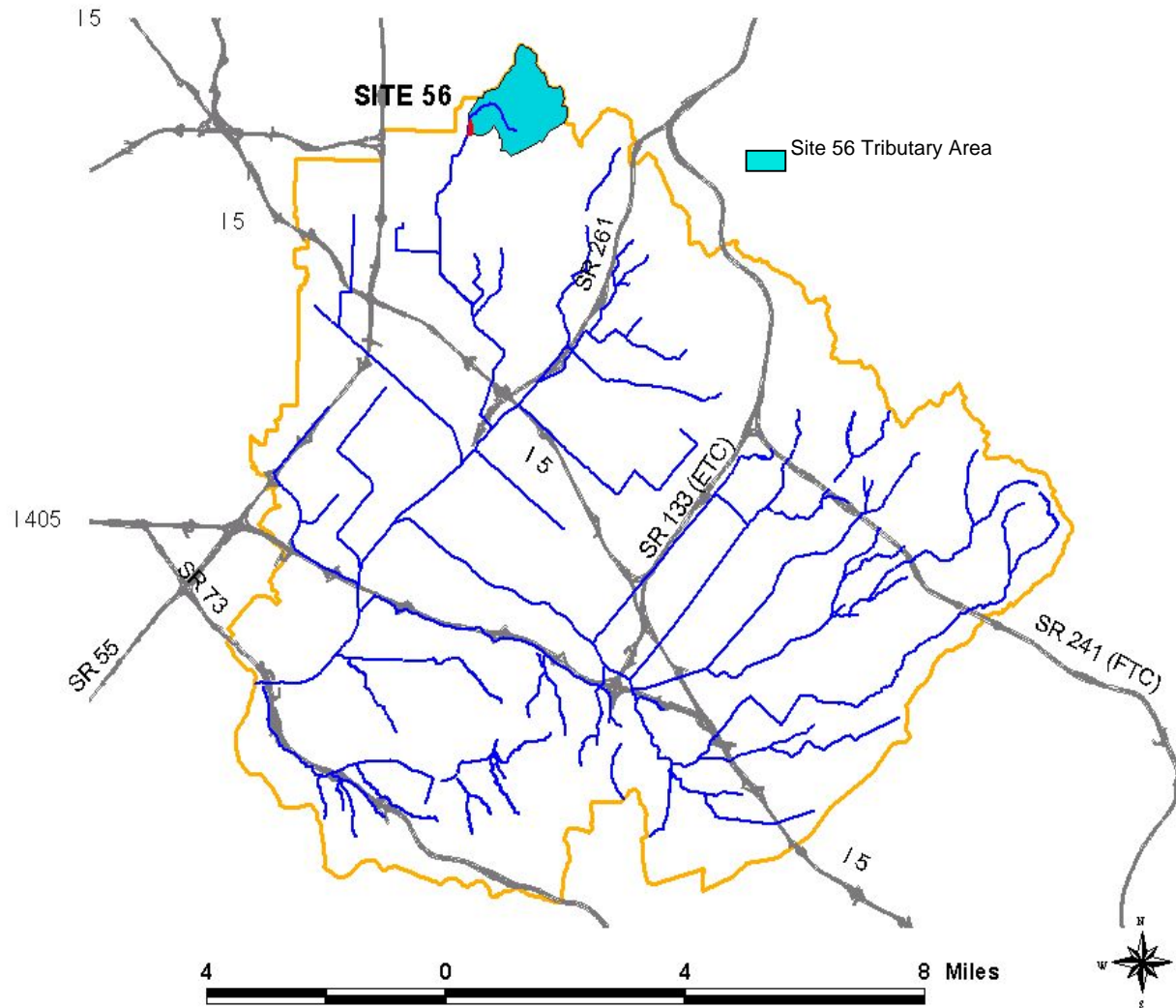
## Type I -- Offline



## Type III -- Colocated



# El Modena Park



# El Modena Park



# El Modena Park



Photo 1 - El Modena Park north end, looking west at inlet weir.

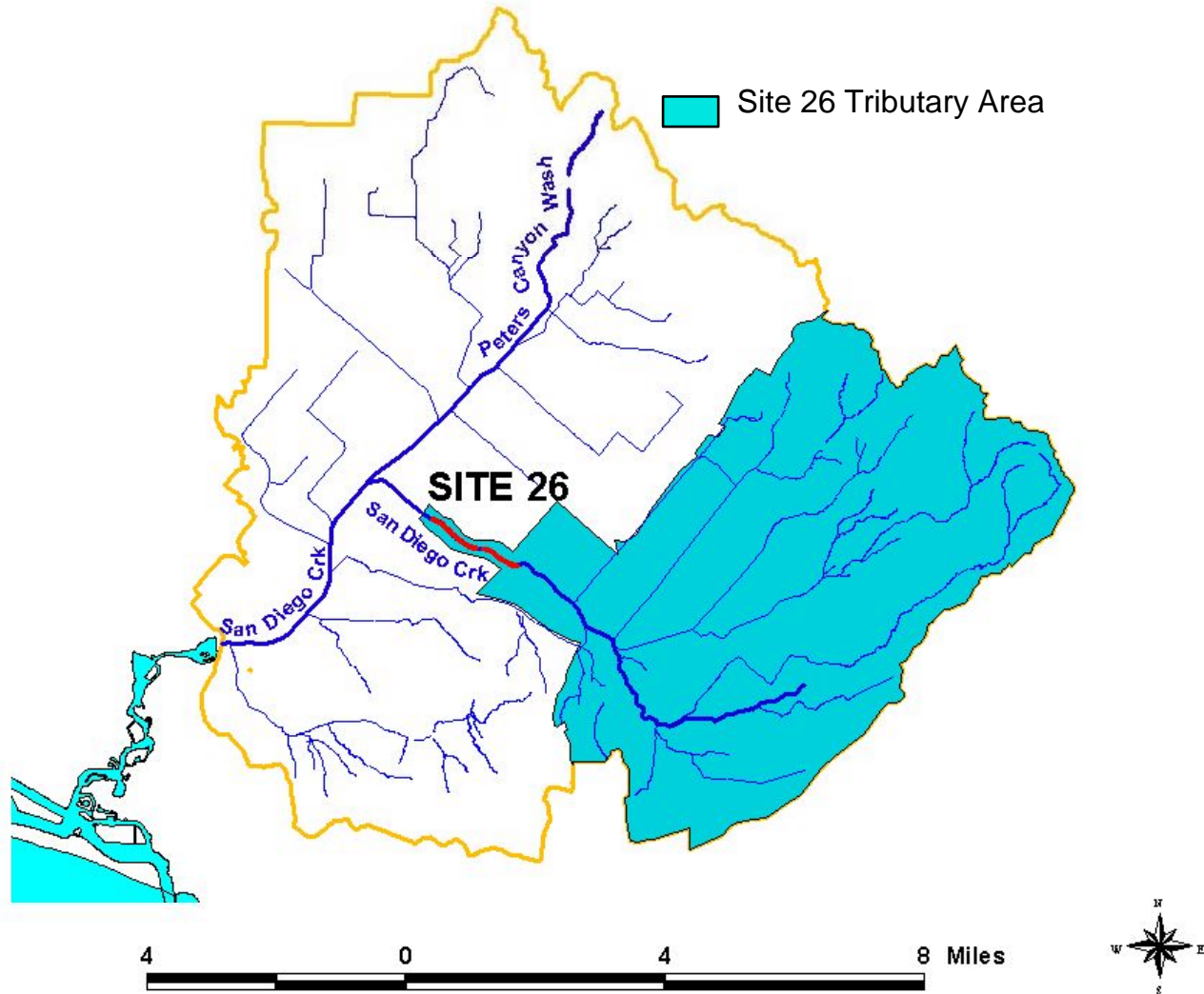


Photo 2 - El Modena -Irvine Channel, looking northeast - inlet weir on right

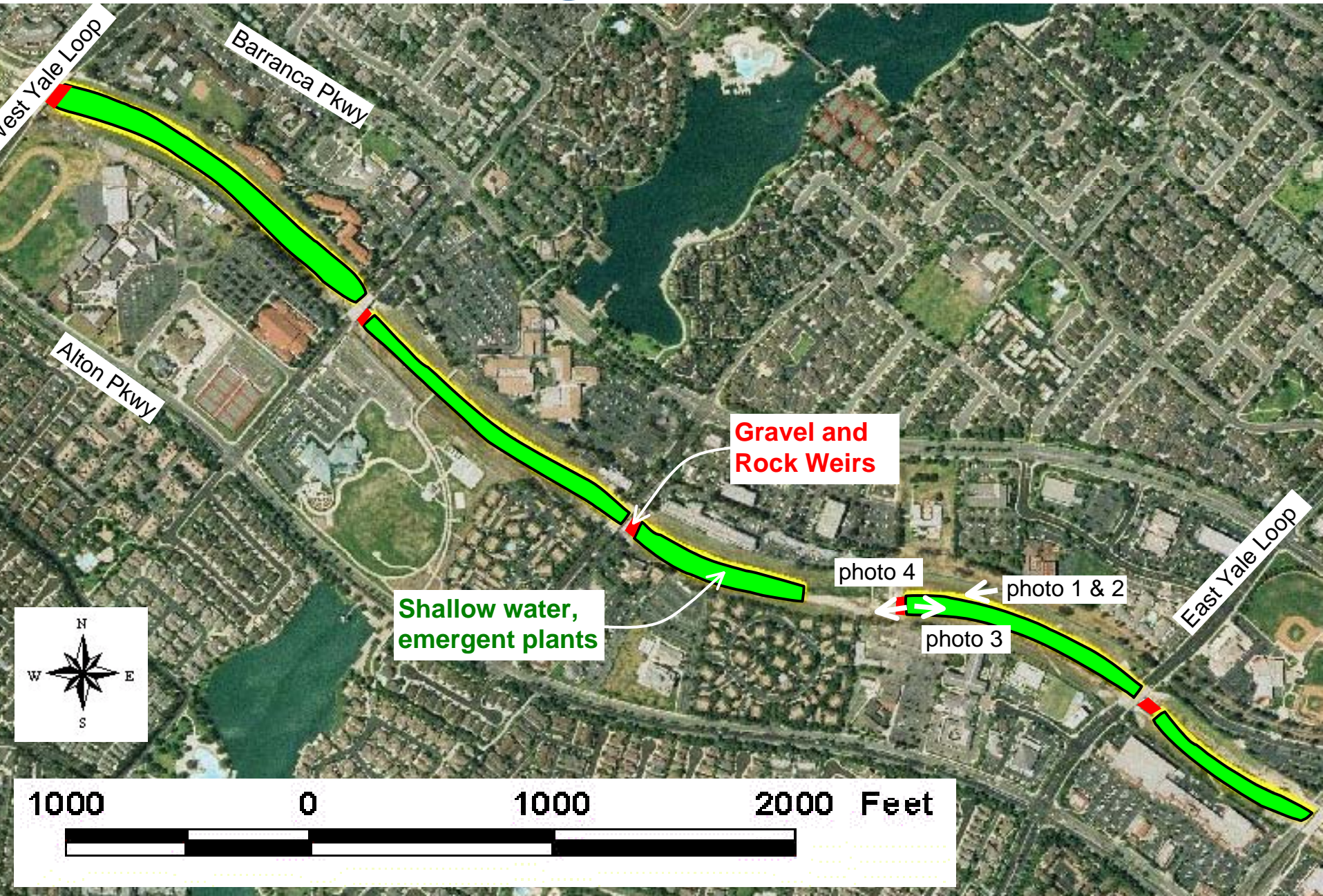


Photos 3 and 4 - El Modena Park north end, looking south.

# Woodbridge In-Line Basins



# Woodbridge In-Line Basins



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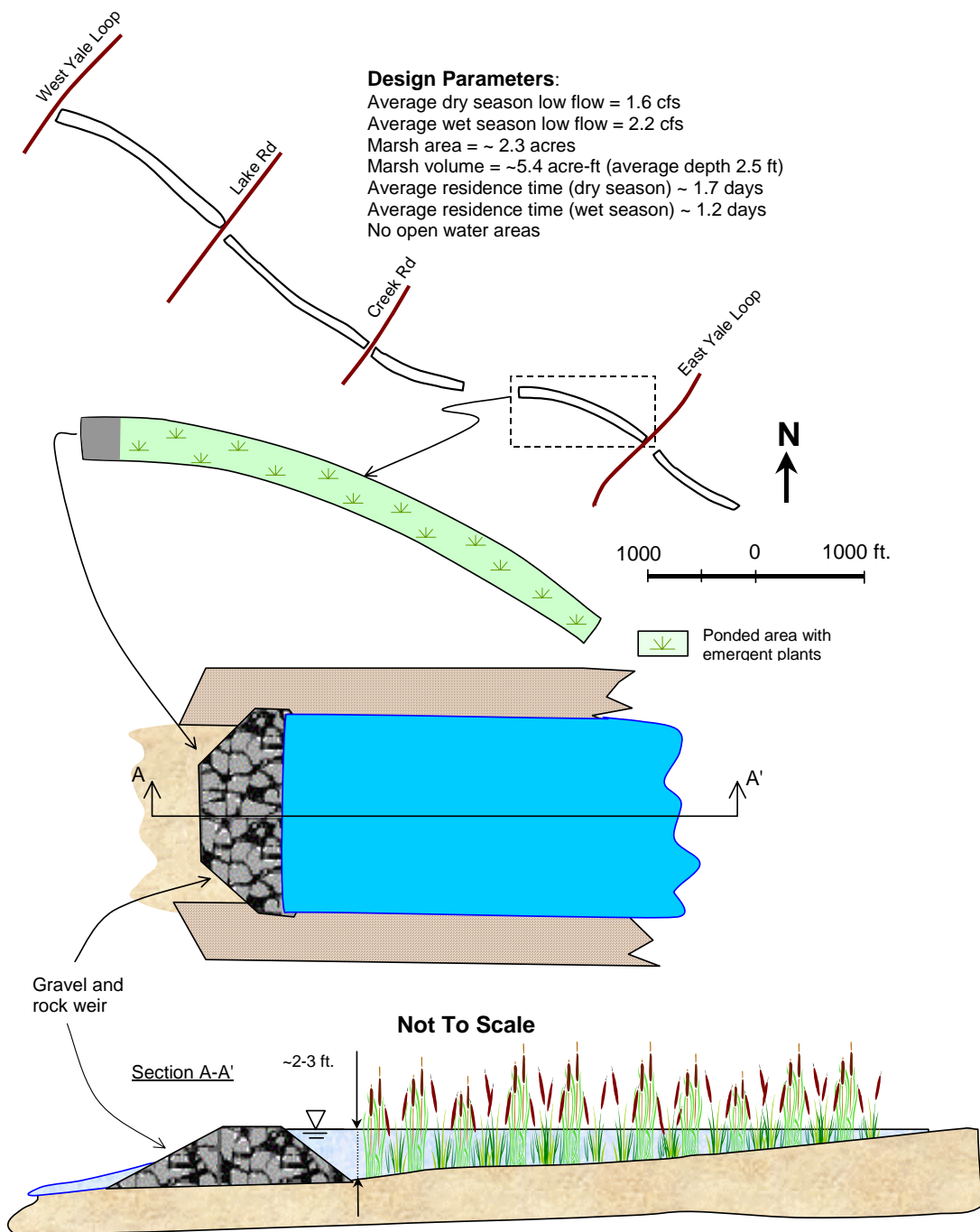
**Photo 1 & 2** - San Diego Creek, looking downstream at grade control structure between E Yale Loop and Creek Road.



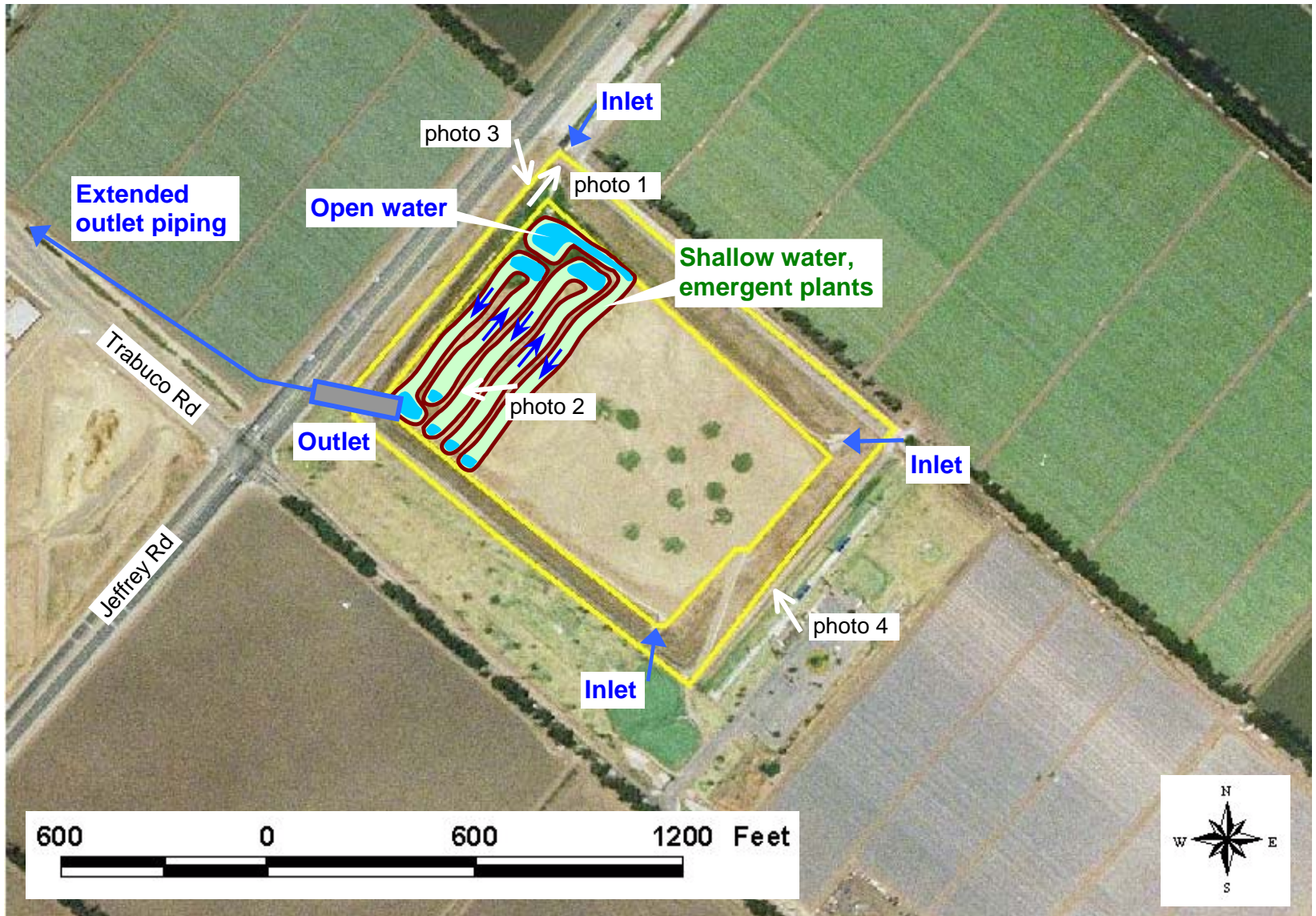
**Photo 3** - San Diego Creek, looking upstream from grade control structure toward East Yale Loop overpass.



**Photo 4** - San Diego Creek looking downstream from grade control structure at energy dissipaters.



# Trabuco Retarding Basin



# Trabuco Retarding Basin



**Photo 1** - Trabuco Basin, north corner inlet, looking north at channel and adjacent Jeffrey Road (left of channel).



**Photo 2** - Trabuco Basin, looking west at outlet to Central-Irvine channel.



# Trabuco Retarding Basin



**Photo 3** - Trabuco Basin, looking south into basin from north corner inlet.



**Photo 4** - Trabuco Basin, looking northwest into basin from golf driving range.

# Pollutant Removal

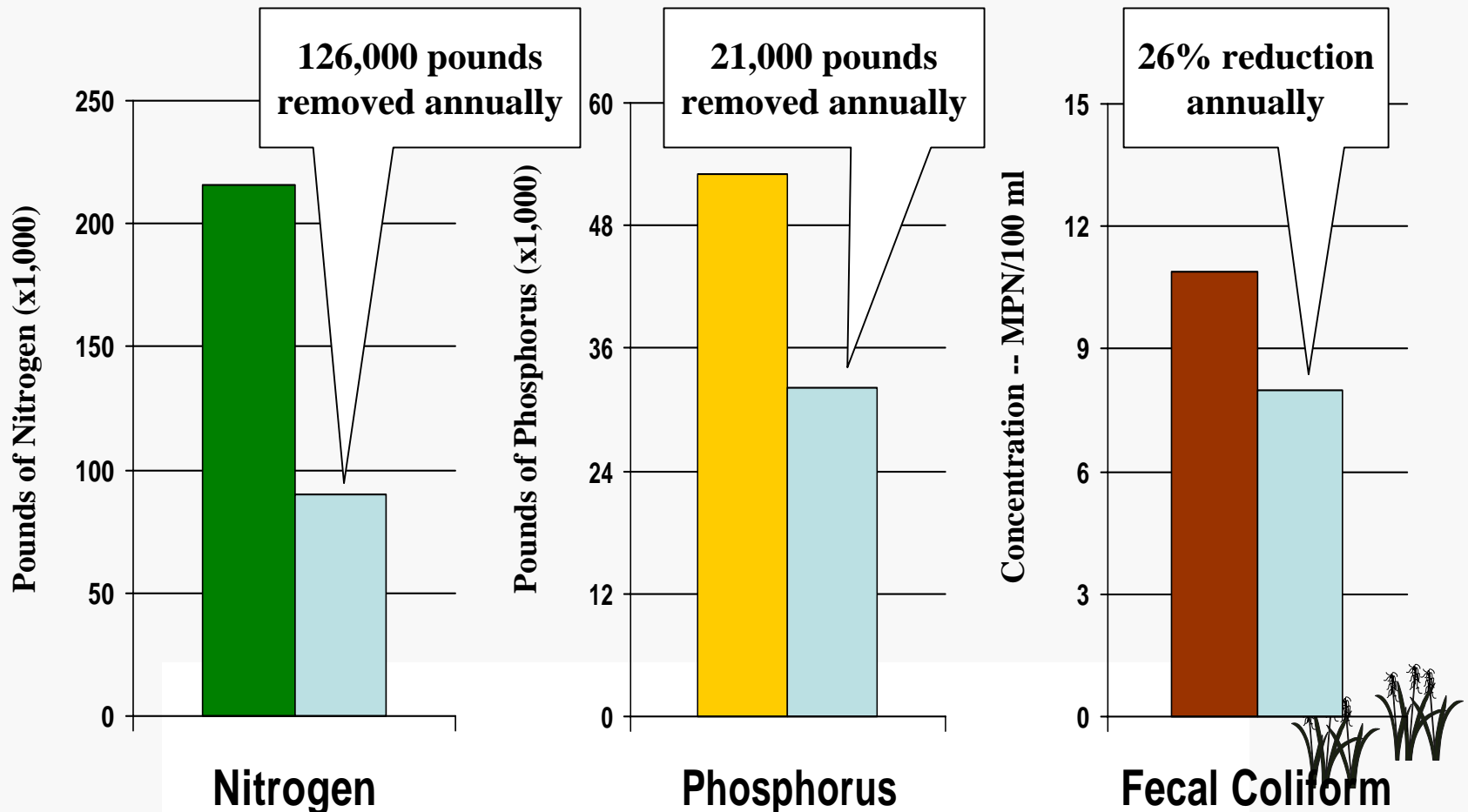
## Dry Weather Flow



**Levels without NTS**



**Levels with NTS**



# NTS and Pathogens

- Experience shows modest removals
- Monitoring as sites are constructed
- Adaptive management--modify or remove unsuccessful sites
- Potential downstream reductions due to removals of other contaminants (ie, nutrients and sediment)

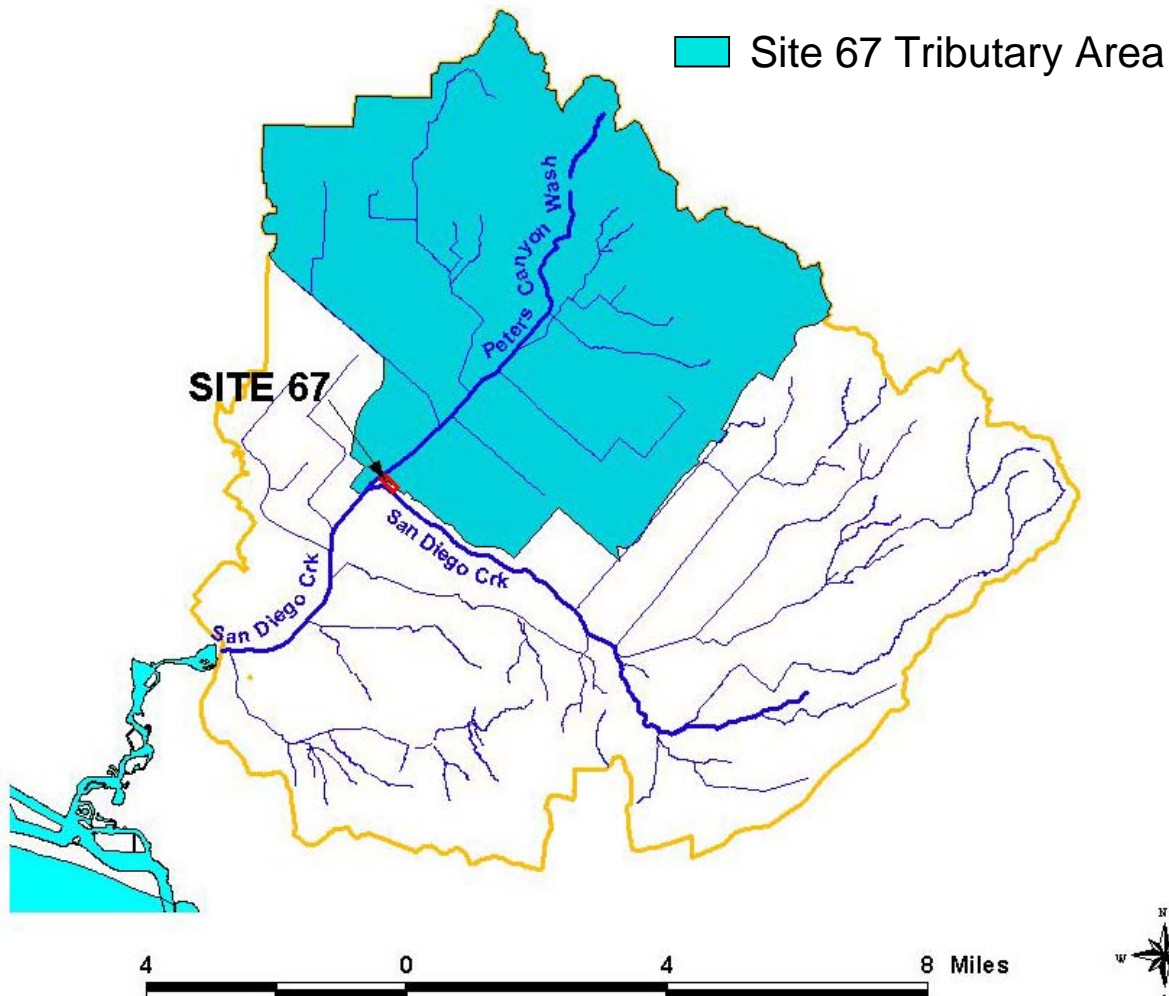


# Selenium Sources

- Selenium is from natural sources distributed throughout the watershed
- It accumulated over the centuries in the Historic Swamp of the Frogs (indicated at left)
- Selenium was naturally treated in this historic wetland for thousands of years
- It is now being released through seepage into flood control channels and groundwater dewatering operations in the area



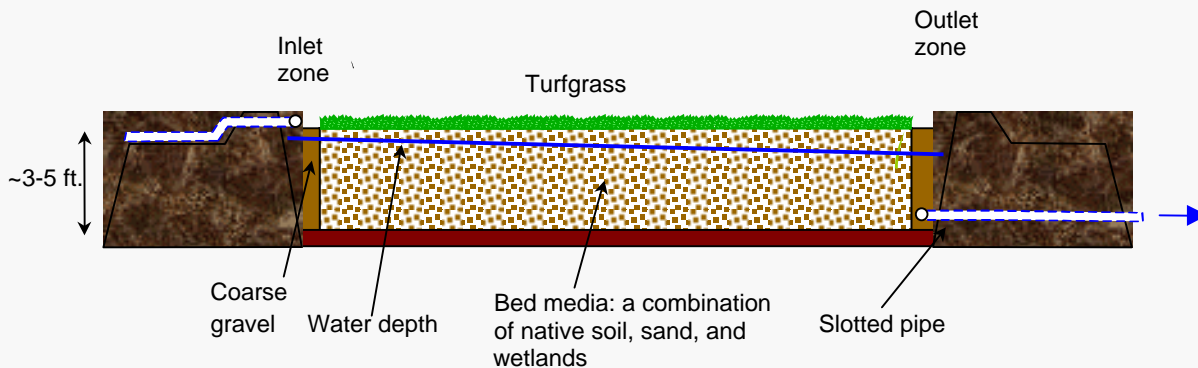
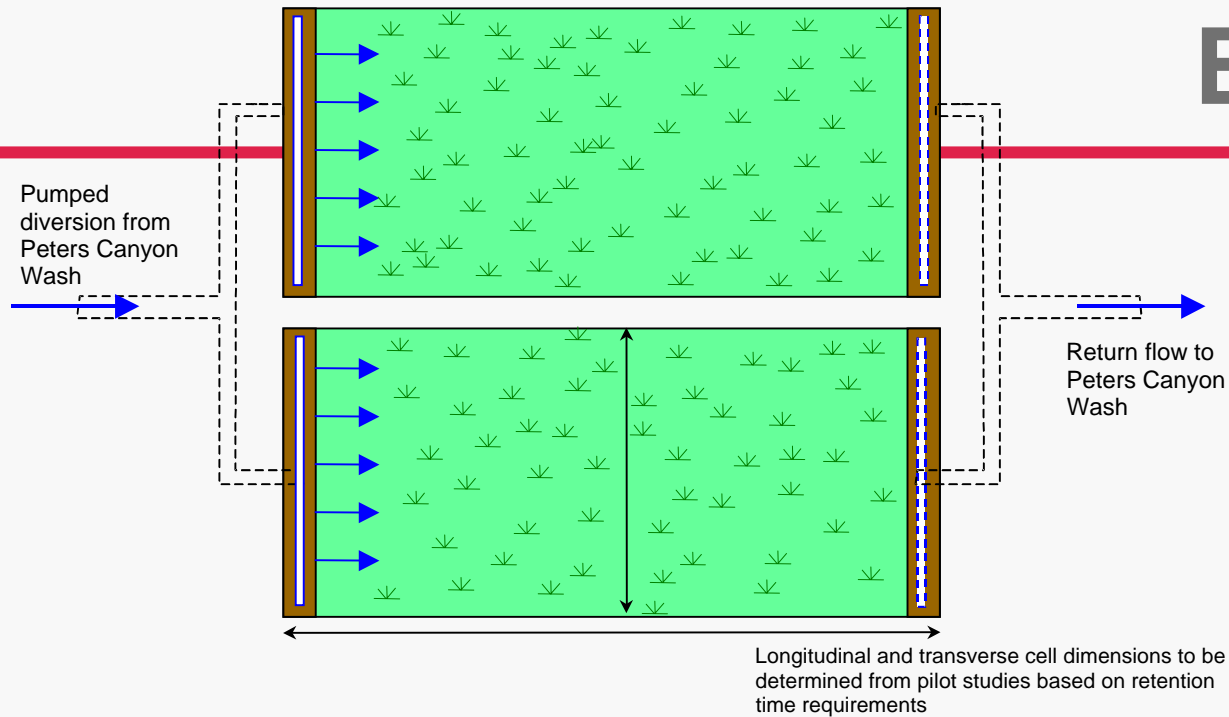
# Site 67 - Cienega Site (Selenium treatment)



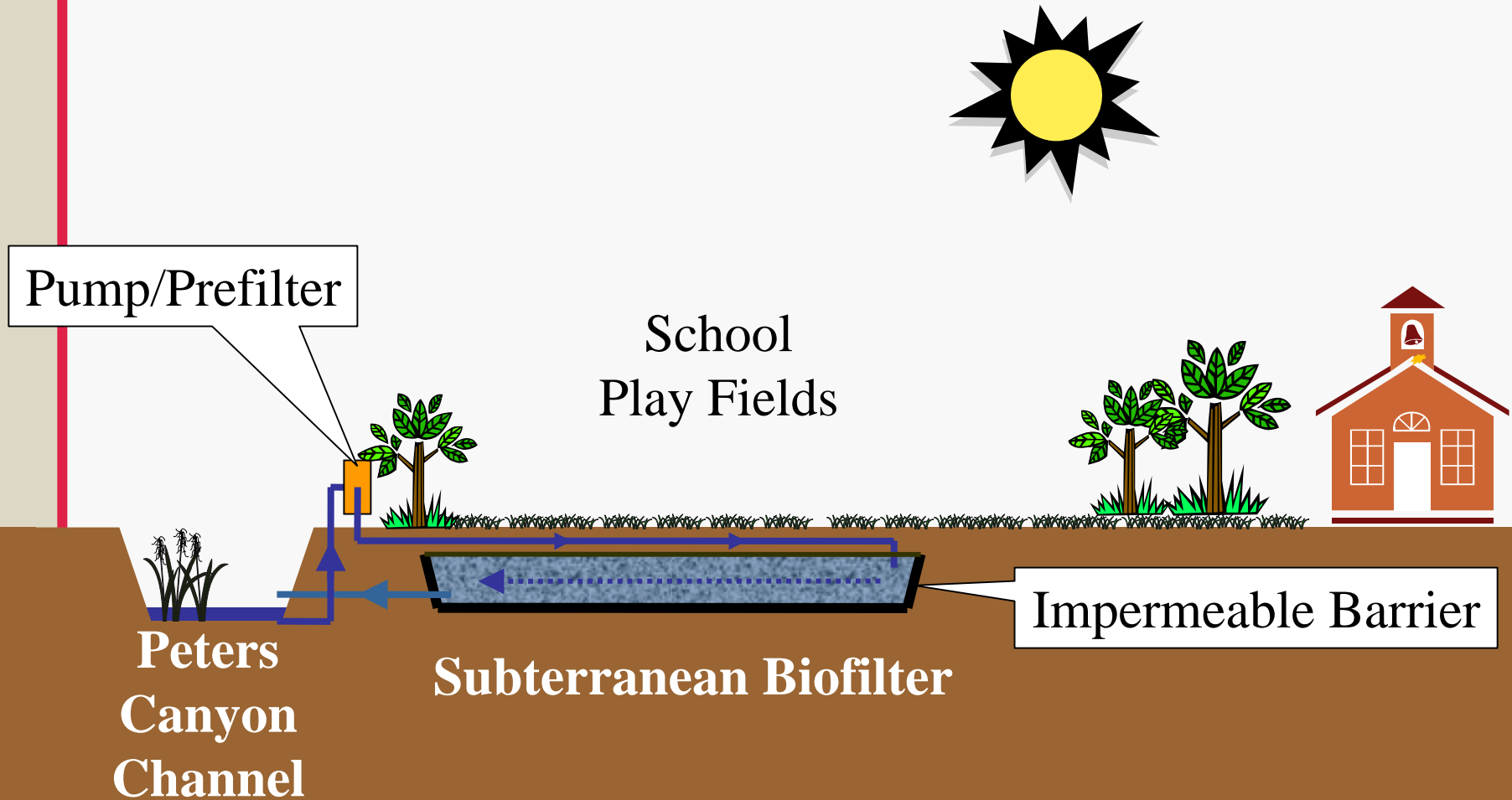
- Located in Peters Canyon Wash downstream from 'Swamp of the Frogs'
- Design partially based on similar operating wetlands in San Francisco Bay
- Treatment concept mimics historic natural processes: sorption to organic rich soils under anoxic conditions
- Pilot treatability studies will be conducted



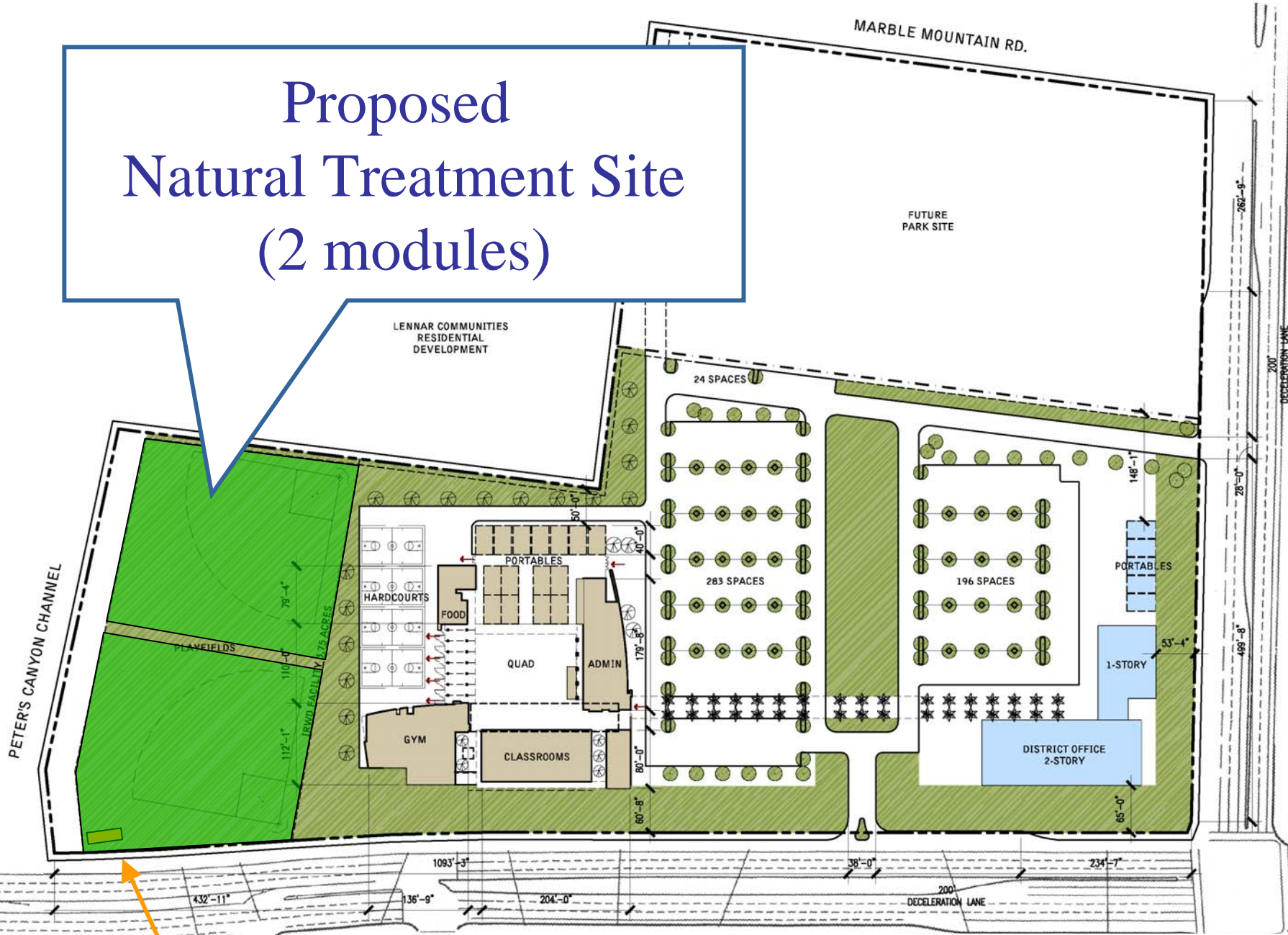
# Subterranean Biofilter



# Subterranean Biofilter



# Proposed Natural Treatment Site (2 modules)



Pump Station

# Ultimate NTS Buildout Costs

- **Construction** **\$41 million**
- **Annual Operation and Maintenance** **\$2 to \$3 million**

**\*Costs will be incrementally incurred as facilities are constructed.**



# Buildout Cost Recovery Model

- **Construction Costs**
  - Developer-donated facilities 55%
  - State/federal grants 35%
  - IRWD bond financing 10%
- **Operation and Maintenance Costs**
  - IRWD water bills 100%



# Schedule

- **Master Planning** Spring 2001 - Spring 2004
- **Environmental Review** Fall 2002 - Spring 2004
- **Phase I Design** Spring 2005 - Fall 2005
- **Phase I Construction** February 2006 - July 2006



# Hot Topics

- **O&M Versus Habitat Preservation**
- **Waters of the US**
- **Bioaccumulation of Toxics**
- **Mosquito Control**
- **Regulatory Framework (TMDLs, MS4, NPDES, Waters of US, Endangered Species)**



# O&M Versus Habitat Preservation

- **Federal Safe Harbor Policy**
  - No complementary State policy
  - Insufficient “net conservation benefit”
  - No coverage for unlisted species; Migratory Bird Treaty Act
- **Central/Southern Orange County Natural Communities Conservation Plan (NCCP)**
  - Adaptive management measure
  - Not Coastal Sage Scrub
  - Possible; but complex, long process
  - Many agreement signatories



# Going Forward

- **Construction**
  - 404 permits, where applicable
  - 401 certifications
  - 1600 Streambed Alteration Agreements
  - 10(a) take permits, if applicable for enhancement of existing wetlands
- **Ongoing O&M**
  - Corps Special Area Management Plan (SAMP)
  - 401 certifications, where applicable
  - 1600 Master Streambed Alteration Agreement
- **Tight control of vegetation; avoiding nesting season**
- **Rotational maintenance**



# Waters of the US

- **Clean Water Act -- No introduction of waste for treatment**
- **Not introducing waste – treating pollution that is already present**
- **Enhancing natural assimilative capacity of the water**



# Bioaccumulation of Toxics

- **Controlled versus uncontrolled wetlands**
- **Monitoring**
  - Water column
  - Sediment
  - Vegetation
  - Biota
- **Permits allow for complete removal of the wetland if a situation arises**



# Mosquito Control

- **Partnership with OC Vector Control District**
- **Hydraulic control**
  - Prevent stagnation
  - Positive drainage – complete drainage
  - Refuge for mosquito fish
- **Vegetation control**
- **Biologic controls**
  - Mosquito/native fish
  - Bti
  - Bats/birds/amphibians
- **Access for application of agents, if necessary**



# Safety

- **Signage**
- **Visibility from surrounding areas**
- **Vegetation design**
- **Shallow shoreline where water is exposed**
- **Preferred access points**
- **Avoid “hideouts”**
- **Fences**
  - Use only when appropriate
  - Ranch style
    - Wooden posts
    - 4-strand smooth or barbed wire
    - Roses or other “deterrence” plants
  - Vinyl-coated chain link where necessary



# Cooperative Effort

- **County of Orange**
- **Watershed Cities -- Irvine, Lake Forest, Newport Beach, Orange, Tustin**
- **IRWD**
- **Landowners**
- **State Water Resources Control Board**
- **Regional Water Quality Control Board**
- **CDFG, USFWS, Corps, EPA, USBR**
- **Coastal Conservancy**
- **Environmental Groups**
- **Residents**



# More Information

**[www.naturaltreatmentsystem.org](http://www.naturaltreatmentsystem.org)**

**Download:**

**Draft NTS Master Plan  
Draft EIR  
Brochure  
More . . .**







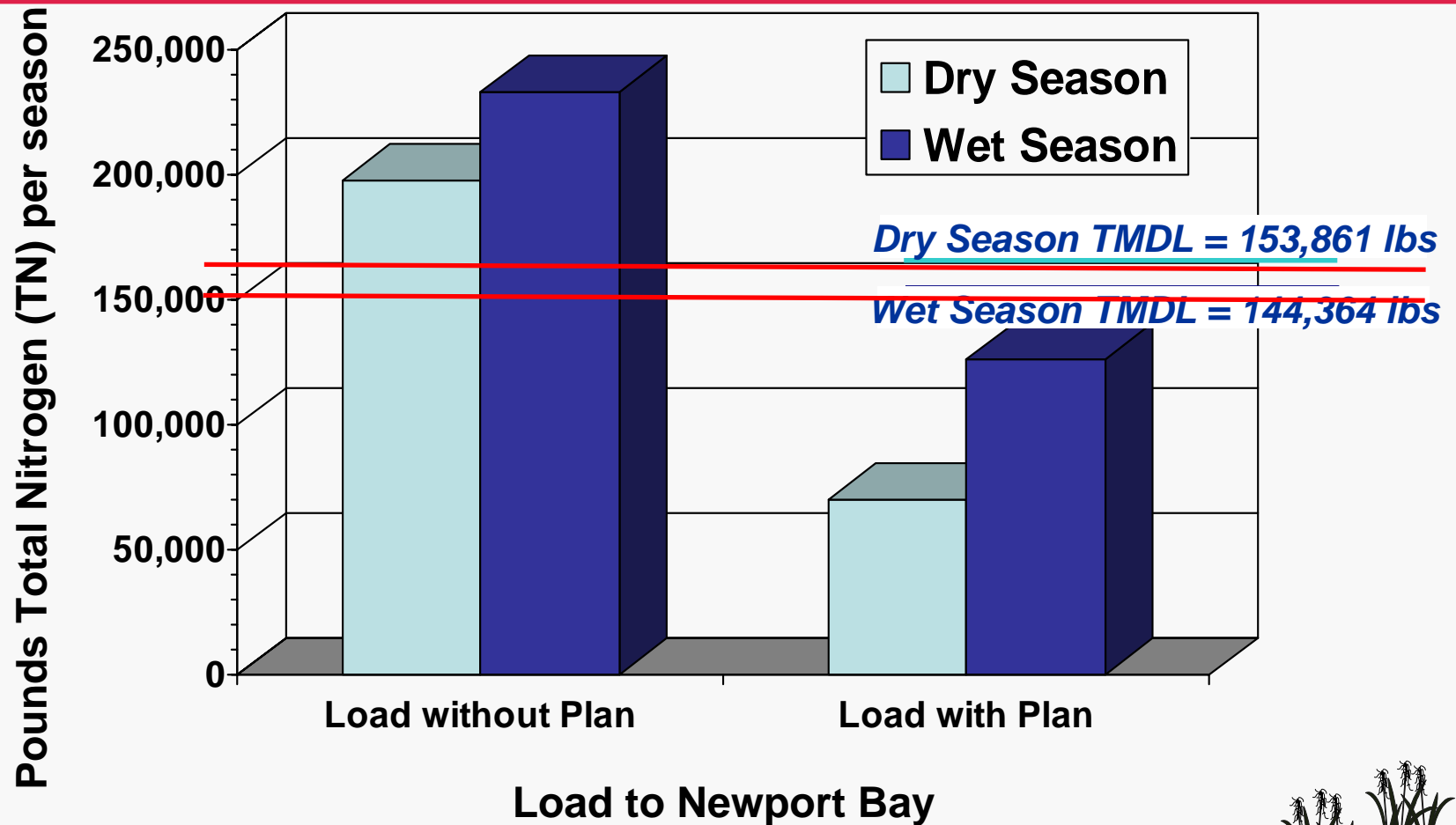
## Expected Effectiveness of the NTS Plan

Flow regimes for which the pollutants of concern have been modeled

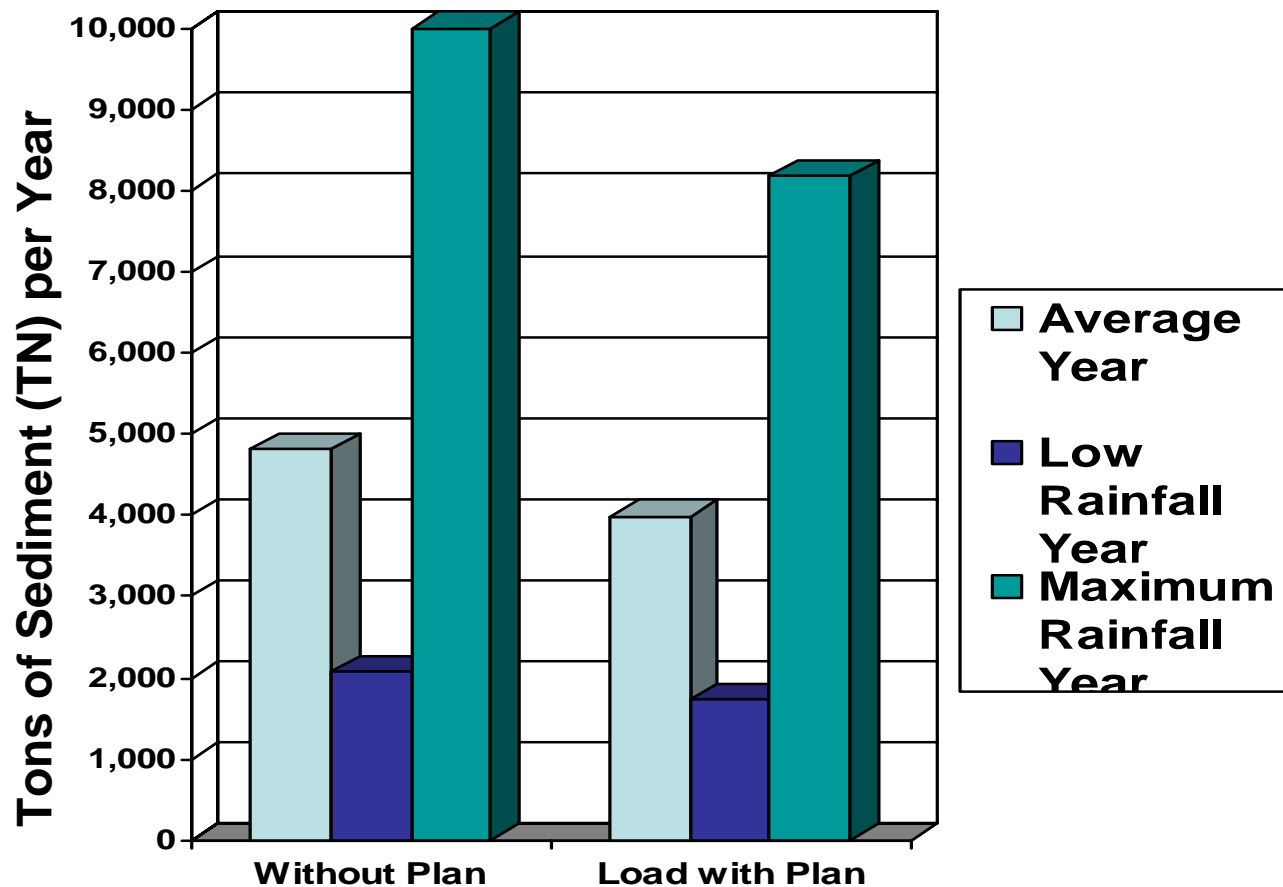
Constituent	Dry season low flow	Wet season low flow	Storm Events
Sediment			X
Total Nitrogen	X	X	
Total Phosphorous			X
Pathogens	X	X	X
Metals			X
Selenium	X	X	
Pesticides and Toxics			

X = TMDL set and modeled

# Nitrogen Reduction - Model Estimates



## Sediment Reduction - Approach & Estimates

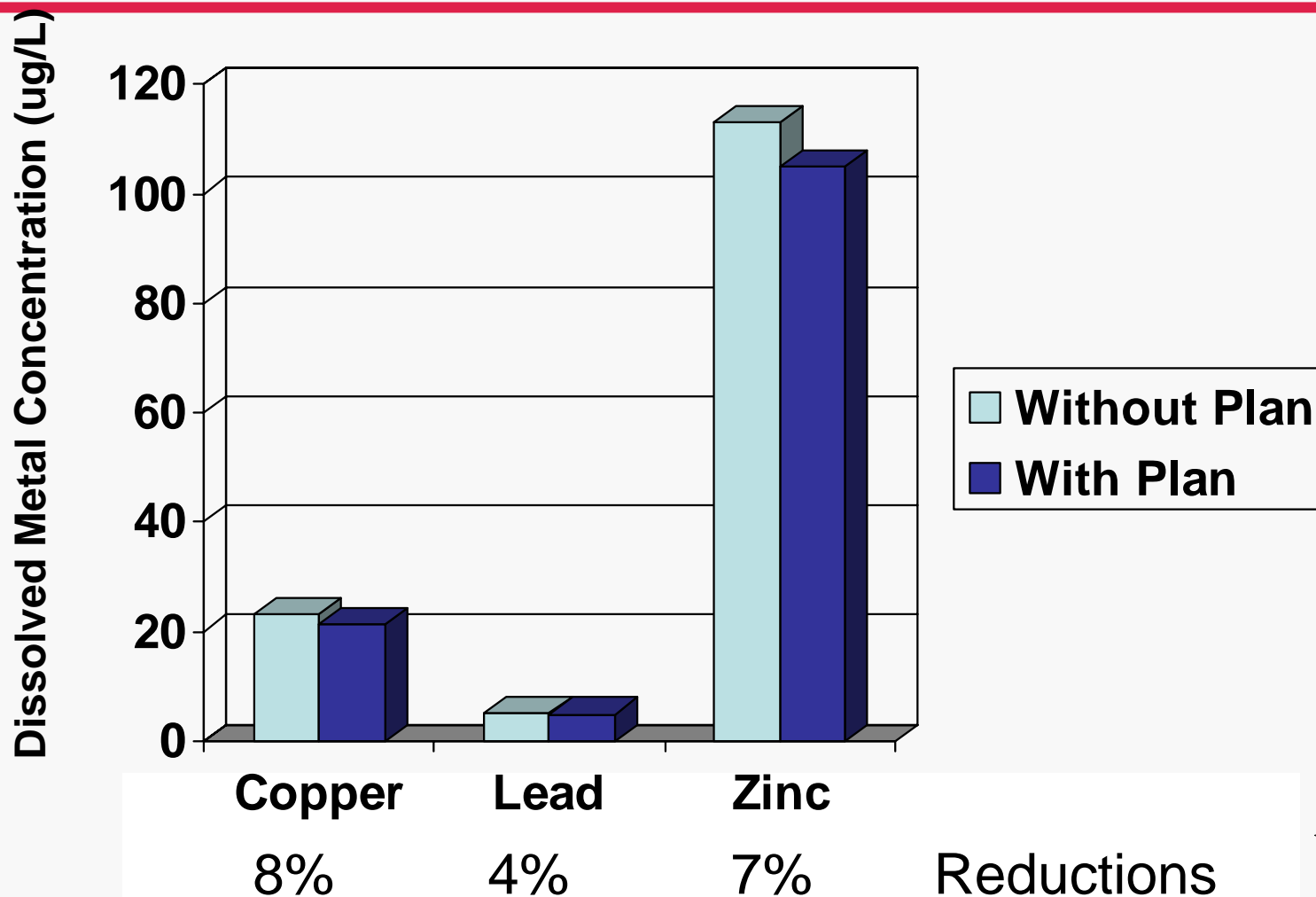


**Average Annual Load to Newport Bay  
from Urban and Open Space Sources**

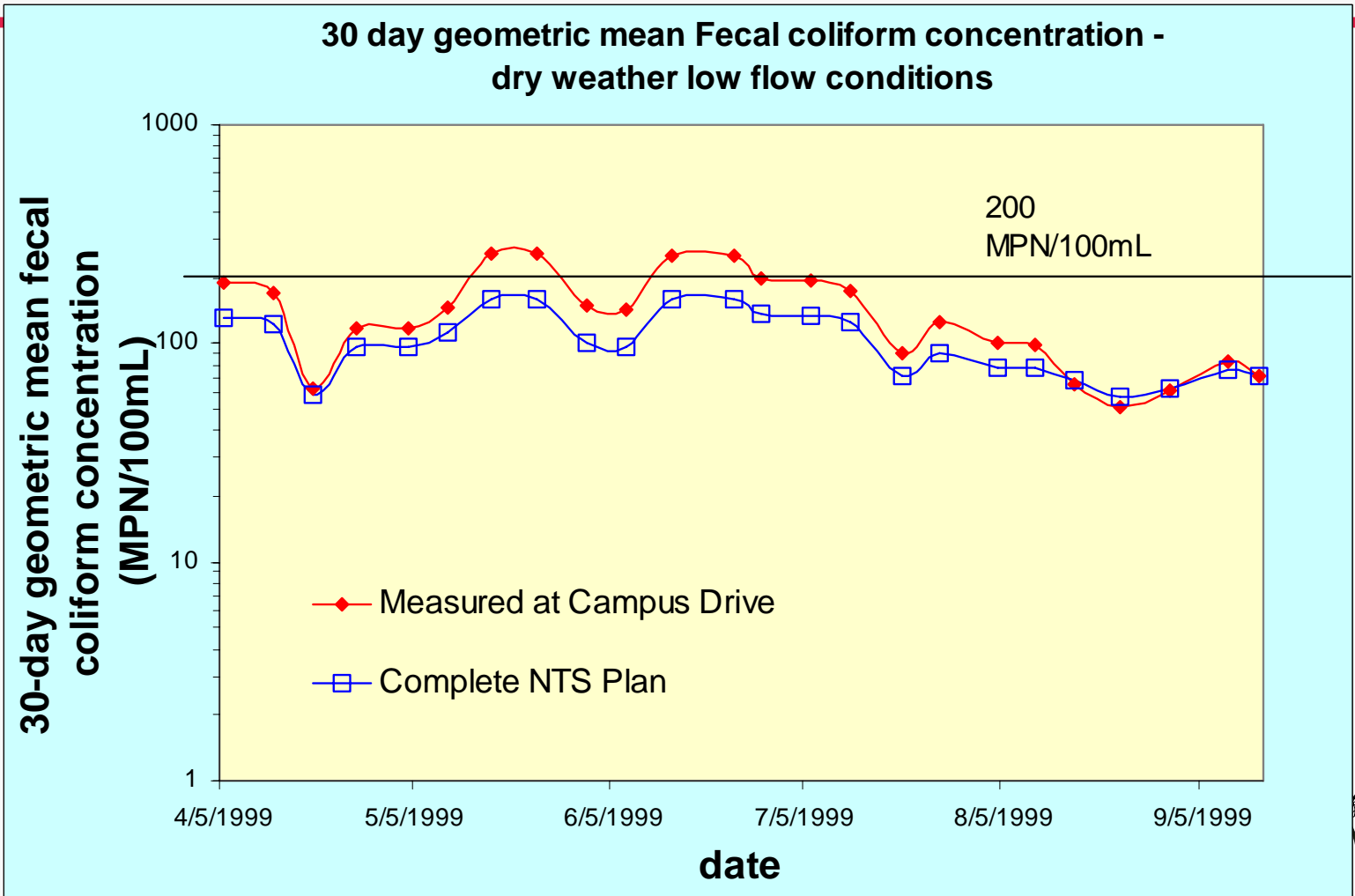
- Estimated loads are rainfall dependent
- NTS facilities are estimated to remove on average 30% of the sediment loads from urban and open space sources
- Does not include instream sources of sediments



# Summary of Estimated Heavy Metals Removal Watershed-Wide



# Fecal Coliform - 30-day Geometric Mean Concentration in dry season low flows



## Log Plot T&F Coliform Attenuation Ratios

